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NEW SPECIES OF CALIFORNIA MAYFLIES IN THE GENUS BAETIS

(Ephemeroptera)

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Living under conditions of great variety, representatives of the genus *Baetis* are found in many types of moving fresh water in California. The small nymphs have adapted themselves to a wide range of temperatures and climates, and are taken at all elevations and at many seasons.

The adult swarms ordinarily consist of a large number of individuals, and flights often occur in bright daylight. Heavily preyed upon by birds and insects, the large populations of *Baetis* are probably a most important element in their survival.

In the present paper, four new *Baetis* are described, these possibly having speciated in the Coastal Valleys of this State.

Baetis leechi Day, new species

(Figures 1 and 2)

Male imago (in alcohol)

Length: Body 4.0 mm.; forewing 4.0 mm.; foreleg 4.0 mm.; tails 9.0 mm.
Head: Pale yellow brown, posterior margin finely black; a broad median Y-shaped black stripe running cephalad from posterior margin, forks into a pair of submedian fine stripes which terminate at lateral ocelli. Basal segment of antenna brown, second segment and filament yellow. Eyes .6 mm. on longest diameter; stalks .4 mm. in height, measured up the outer side.
Thorax: Pronotum yellow washed with black. Mesonotum bright red brown, median suture and margins of scutum finely black. Scutellum pale, a pair of very small submedian pale spots anterior to this pale area; heavily margined with black. Sternum with brown sclerites outlined in black. *Legs:* Coxae brown; foreleg smoky with femur darker; middle and hindlegs pale. *Wings:* Hyaline, stigmatic area strongly milky and with 3-5 crossveins

strongly slanting; a small dark spot at base of each wing. Wingveins entirely colorless. Paired marginal intercalaries of forewing longest toward costal margin but lacking in first interspace. Hindwing with three longitudinal veins, the third close to and joining hind margin about half-way to tip; no crossveins or intercalaries; costal projection prominent and strongly curved much as in *Centropilum*. *Abdomen*: Tergite 1 red brown, 7-10 opaque yellow with faint cast of brown; 2-6 hyaline palest yellow brown with wide white hyaline posterior margins; wide whitish median and paramedian stripes full length of tergites 2-6. Sternites 1-7 hyaline palest yellow. The wide black geminate lines along pleural fold enclose a strong black spiracular spot and another dark spot near anterior margin on each segment 1-7. *Genitalia*: Second joint of forceps tapered as in the *intercalaris* group. All segments of forceps translucent milky white; a fine black lateral line at base of first segment of forceps. *Tails*: Translucent milky white; joinings white.

Holotype: Male imago, collected by Helen L. Day and the author on CONN CREEK, near RUTHERFORD, NAPA COUNTY, CALIFORNIA, September 24, 1949, in California Academy of Sciences collection. *Paratypes*, all topotypical: 5 ♂ in Canadian National collection; 5 ♂ in Cornell University collection; 5 ♂ to G. F. Edmunds, Jr.; 40 ♂ in author's collection.

Diagnosis: *B. leechi* Day is the first *Baetis* with hindwing of the *quilleri* type reported from California. *B. leechi* is quite close to *B. erebus* Traver but, apart from color differences, *B. leechi* is smaller and lacks crossveins and intercalaries in the hindwing.

In describing this new species, I take pleasure in naming it in honor of Hugh B. Leech of the California Academy of Sciences.

***Baetis diabolus* Day, new species**

(Figures 3 and 4)

Male imago (in alcohol)

Length: Body 9.0 mm.; forewing 8.0 mm.; foreleg 6.5 mm.; tails 17.0 mm. *Head*: Dark red brown. Antenna dark red brown, white tipped. Eyes rather large, moderately elevated; .9 mm. in greatest diameter, stalk .4 mm. in height, measured up the outer side. *Thorax*: Pronotum fuscous with a few pale markings. Mesonotum fuscous; small postero-lateral areas, area anterior to scutellum and outer parapsidal furrows pale. Scutellum outlined in black. Sternum fuscous. *Legs*: Coxae dark brown edged with black. Foreleg yellow brown. Middle and hindlegs whitish. *Wings*: Clear hyaline, stigmatic area of forewing milky. Crossveins of stigmatic area and longitudinal veins of forewing pale gray, except those of anal area which are colorless. Crossveins of stigmatic area irregular, some forking, with short horizontal veins between. Marginal intercalaries short, a pair of shorter ones in the first interspace. Hindwing with three long veins, the second vein forking from a point about three-fifths distant from the base; usually with one intercalary between first and second vein, and two intercalaries within the fork of the second vein. Third vein straight, rather long. Costal projection of the hind wing acute. *Abdomen*: Segments 1 and 7-10 dark brown; 2-6 hyaline yellow brown,

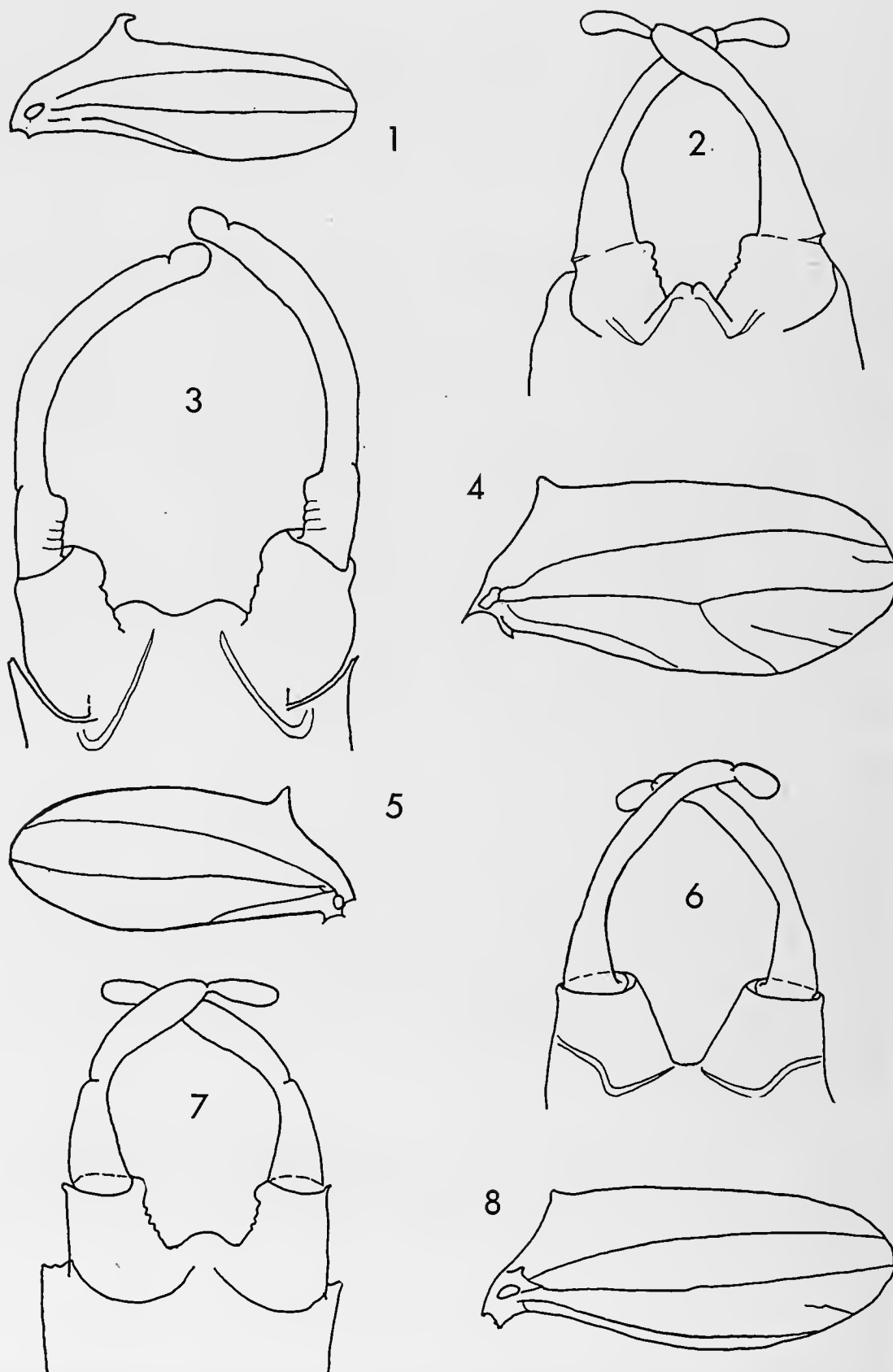


Fig. 1 *Baetis leechi*, hindwing; Fig. 2 *Baetis leechi*, genitalia; Fig. 3 *Baetis diablus*, genitalia; Fig. 4 *Baetis diablus*, hindwing; Fig. 5 *Baetis alius*, hindwing; Fig. 6 *Baetis alius*, genitalia; Fig. 7 *Baetis sulfurosus*, genitalia; Fig. 8 *Baetis sulfurosus*, hindwing.

tergites darker. Tergites with wide dark paramedian stripes, one on each side. Sternites each with a pair of short oblique dark dashes from middle of anterior margin. Anterior margins of segments finely dark; posterior margins white. *Genitalia*: Distinctly of the *moffati* type, first and second segments dark brown, third and fourth smoky brown; third and fourth segments almost completely fused, their joining marked with a short black line on the outer side. *Tails*: Yellow brown, a few basal segments very dark and tips white. All joinings hyaline white edged with smoky.

Holotype: Male imago, collected by E. I. Schlinger on Mt. DIABLO, CONTRA COSTA COUNTY, CALIFORNIA, April 12, 1952, in California Academy of Sciences collection. *Paratypes*, all topotypical; 1 ♂ in Canadian National collection; 1 ♂ in Cornell University collection; 1 ♂ to G. F. Edmunds, Jr.; 2 ♂, slides of genitalia and wings in author's collection.

Diagnosis: *Baetis diablus* Day is, to date, the exclusive species of the genus having a forked second hindwing vein combined with genitalia of the *moffati* type. The fork of the second hindwing vein is unlike that of *B. parvus* or *B. devinctus*, as it branches much closer to the distal margin of the hindwing. The fork of the vein in *B. diablus* is comparatively shallow and obtuse.

***Baetis alius* Day, new species**

(Figures 5 and 6)

Male imago (in alcohol)

Length: Body 6.0 mm.; forewing 5.5 mm.; foreleg 5.0 mm.; tails 12.0 mm. *Head*: Dark brown. Antenna brown with white tip, base ringed with white. Eyes .75 mm. on longest diameter; stalks .5 mm. in height measured up the outer side. *Thorax*: Pronotum blackish brown, paler in median area. Mesonotum red brown, scutellum paler; median suture, outer parapsidal furrows, posterior third of inner parapsidal furrows and margins of scutum finely black. Metanotum margined with black. *Legs*: Coxae brown. Forefemur and foretibia yellowish; all other segments white. Tarsal joinings of middle and hindleg finely black. *Wings*: Clear hyaline; wingveins colorless. Stigmatic area of forewing milky, translucent; crossveins simple, strongly slanting, with a few short horizontal veins between. Paired intercalaries of first interspace very long, those of second and third interspace longer than those following. Hindwing with strong costal projection and three longitudinal veins, the third very short and close to hind margin; first and second veins convergent distally; intercalaries not present. *Abdomen*: Segment 1 and 7-10 dark brown. Segments 2-6 hyaline, thinly washed with dark brown, anterior margins of tergites edged with black. A dark geminate line along pleural fold. Each spiracle of middle segments strongly marked with outline of small circle, dark tracheal lines extending onto tergites and sternites from these circles. *Genitalia*: Genitalia of the *intercalaris* type; smoky brown with first segment dark brown at base. *Tails*: Milky white, first few basal segments light smoky.

Nymph (in alcohol)

The pale nymph has light brown dorsum with tergites 5 and 9

pale; tergite 5 with a pair of small dark submedian spots. Anterior margins of tergites narrowly black. Tergites 1–7 with small black mark at base of each gill. Femoro-tibial knees black. Middle tail two-thirds as long as outer tails.

Holotype: Male imago, collected by Helen L. Day and the author on RUSSIAN RIVER, near GEYSERVILLE, SONOMA COUNTY, CALIFORNIA, October 15, 1949, in California Academy of Sciences collection. *Paratypes*, all topotypical: 5 ♂ in Canadian National collection; 5 ♂ in Cornell University collection; 5 ♂ to G. F. Edmunds, Jr.; 35 ♂ in author's collection; 50 ♂ collected November 12, 1949, in author's collection.

Diagnosis: Lacking a tubercle on the inner margin of the basal joint of the forceps, *B. alius* Day, with genitalia of the *intercalaris* type, has no known close relative in California. The adults swarm some six to ten feet above the water from 10:30 A.M. to 3:00 P.M.

Baetis sulfurosus Day, new species

(Figures 7 and 8)

Male imago (in alcohol)

Length: Body 4.0 mm.; forewing 4.0 mm.; foreleg 3.75 mm.; tails 10.0 mm. *Head*: Clypeus and face brown; vertex pale yellow with narrow black Y-shaped mark based on posterior margin and opening forward. Antenna brown, set in wide white circular sclerites. Eyes .6 mm. on longest diameter; stalks .25 mm. in height measured up the outer side. *Thorax*: Notum blackish brown. Mesonotum with median furrow and outline of scutum black; scutellum pale at base and a pair of small pale spots anterior to pale area. Tergum brown, median sclerites outlined in black. *Legs*: Coxae and trochanters brown, margins finely black; all other segments light smoky brown. *Wings*: Forewing hyaline, stigmatic area milky white. Subcosta and R₁ brown; other longitudinal veins usually finely dark and crossveins pale; crossveins of stigmatic area often dark and sometimes tending to anastomosis. First interspace with a single marginal intercalary. Hindwing with costa dark before the projection, and other veins dark in basal one-third; sometimes with an intercalary between second and third veins. *Abdomen*: Tergite 1 blackish brown; 7–9 paler; 2–6 hyaline smoky brown. Sternite 1 and 7–9 yellow brown; 2–6 hyaline yellow. *Genitalia*: Genitalia of the *intercalaris* type; first and second segments of forceps pale smoky brown, dark brown at base of first segment; third and fourth segments pale smoky, edged with black when seen in ventral or dorsal view; fourth segment one-half the length of third segment. *Tails*: Milky white, a few basal segments very faintly smoky.

Holotype: Male imago, collected by Helen L. Day and the author on the P. C. Hale Ranch, SULPHUR CREEK, SONOMA COUNTY, CALIFORNIA, August 25, 1951, in California Academy of Sciences collection. *Paratypes*, all topotypical: 5 ♂ in Canadian National collection; 5 ♂ in Cornell University collection; 5 ♂ to G. F.

Edmunds, Jr.; 65 ♂ in author's collection. 25 ♂ from Capell Creek, Napa County, California, collected on May 20, 1950, in author's collection.

Diagnosis: *B. sulfurosus* Day is quite close to *B. thermophilos* McDunnough, the latter described from Yellowstone Park, Wyoming. Apart from being smaller and much paler, *B. sulfurosus* has the third vein of the hindwing closer to the posterior margin of the wing, and the fourth segment of the forceps is proportionately only about one-half as long as that of *B. thermophilos*.

B. sulfurosus is undoubtedly the "closely allied species . . . from Cloverdale, California," mentioned by Traver in discussing *B. thermophilos*, p. 702, *Biology of Mayflies*. The confluence of Sulphur Creek with the Russian River is about two miles north of Cloverdale.

With shade temperature at 96° F., *B. sulfurosus* was found swarming at noon fully one-quarter mile from the stream. Having plenty of tree-shade available, this species preferred to swarm in the open, three or four feet above bare rock and gravel.

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A CHECK LIST OF THE GENERA & SPECIES OF MALLOPHAGA.

By G. H. E. Hopkins and Theresa Clay. Pp. [6+] 1-361. Published by the Trustees of the British Museum, London. Issued April 1, 1952. Price £2.

This is a model check list; it is a pleasure to use. The listing of genera, and of species within the genera, is alphabetical. All specific names which have been proposed in a given genus are entered under that generic name. By using different type faces the authors indicate which names they consider to represent valid generic or specific concepts, which are synonyms, and which have been removed to other genera. In the last two instances there are cross-reference entries. Type species are cited. Hosts are given wherever known, and corrections suggested for records thought to be erroneous.

The list is based on a study of the world fauna, hence many genera proposed in regional works are synonymized. It is difficult to tell how many generic synonymies are original in this book; some are based on unpublished findings (p. 255: "Although separate from *Otidoecus* if only the described species are considered, undescribed species completely bridge the gap between the two groups."). Pages 1 to 17 are introductory and explain the authors' nomenclatorial concepts and working procedure.—H. B. LEECH.